Lab on Polar Functions

1. Graph of sin t (1 point)

What is the polar graph of sin(t)?

a. A circle of radius 1 centered at the origin.
b. A circle of radius 1/2 centered at (0,1/2).
c. A circle of radius 1/2 centered at (0,-1/2).
d. A circle of radius 1/2 centered at (1/2,0).
e. A circle of radius 1/2 centered at (-1/2,0).

2. Smallest t (1 point)

Set the grapher to start when $t = 0$. What ending value of t is the smallest you need to have the entire circle traced?

a. Pi/4
b. Pi/2
c. Pi
d. 2*Pi
e. 4*Pi

3. sin nt (0.5 point)

Graph sin(n*t) for various integer values of n. Make a conjecture about the number of "petals" on the "rose."

a. n petals
b. n petals if n is even, 2*n petals if n is odd
c. n petals if n is odd, 2*n petals if n is even
d. 2*n petals

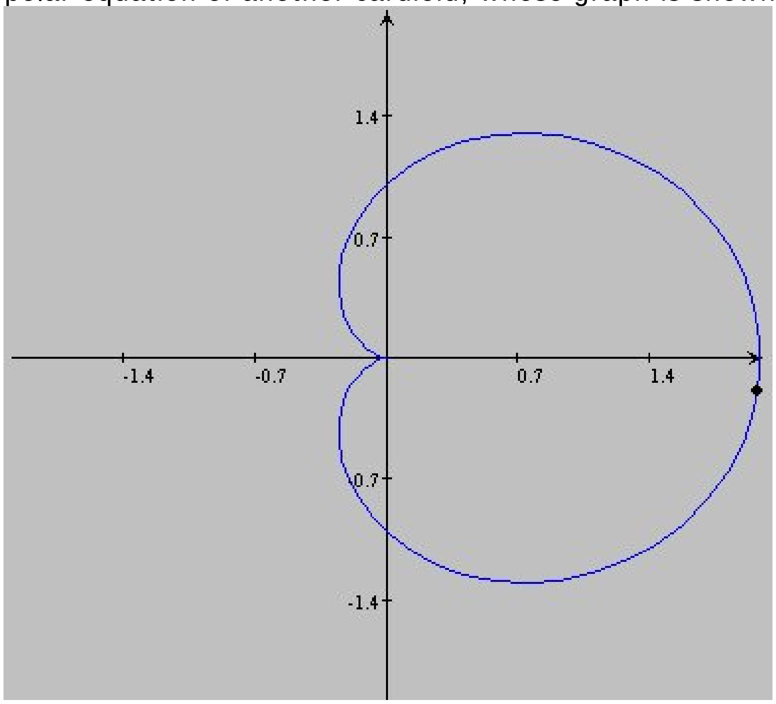
4. cos nt (0.5 point)

Graph cos(n*t) for various integer values of n. Make a conjecture about the number of "petals" on the "rose."

a. n petals
b. n petals if n is even, 2*n petals if n is odd
c. n petals if n is odd, 2*n petals if n is even
d. 2*n petals

5. **Cardioid** **(1 point)**

The graph of 1-sin(*t*) is called a cardioid, because it is heart shaped. Find the polar equation of another cardioid, whose graph is shown below.



a. 1 - sin(*t*)
b. 1 + sin(*t*)
c. 1 - cos(*t*)
d. 1 + cos(*t*)

6. **Symmetry 1** **(0.5 point)**

The graph is symmetric with respect to the polar axis. What does this say about the algebraic symmetry of the function?

a. r(t) = r(-t)
b. r(t) = - r(t)
c. r(t) = r(Pi/2 - t)
d. r(t) = r(Pi - t)

7. **Symmetry 2** **(0.5 point)**

A graph is symmetric with respect to the vertical line corresponding to *t* = Pi/2. What does this say about the algebraic symmetry of the function?

a. r(t) = r(-t)
b. r(t) = - r(t)
c. r(t) = r(Pi/2 - t)
d. r(t) = r(Pi - t)

8. Shape matching (1 point)

Be a little bit artistic here.

sin(t)*cos(3*t) Fish

sin(t)*cos(2*t) Butterfly

sin(t)*cos(5*t) Spider

9. Spiral (1 point)

Think about what the graph of $r(t) = t$ might look like before you try to graph it. What happens to the graph if you allow negative values of *t*?

a. It is a circle, with symmetric values for negative t.
b. It is a parabola, with symmetric values for negative t.
c. It is a spiral, opening out in the opposite direction for negative t.
d. It is a cross between a fish and a spider, and is not defined for negative t.
e. It is a rose with more and more petals, whether t is positive or negative.

10. Fine print (1 point)

I wrote the polar grapher using what are called parametric plots, which treat both *x* and *y* as depending on *t*. If you look at the "fine print" at the bottom of the grapher you can see the formulas for how *x* and *y* points are being generated. What is the recipe I use?

a. It is based on the conversion formulas from polar to rectangular coordinates, with r given by the polar function of t that is being plotted.
b. It is based on the conversion formulas from rectangular to polar coordinates, with x and y computed by the Pythagorean theorem.
c. It comes from the metric system.
d. It comes from the reciprocal identities.
e. It is based on solving quadratic trig equations to determine x and y.

11. Vertical line test (2 points)

The "vertical line test" can be used to decide if the graph of a given cartesian equation in rectangular coordinates *x* and *y* represents a function. Explain in a sentence or two why the vertical line test doesn't apply for graphs of polar functions.